

PB90-166307

Proposed Best Demonstrated Available Technology (BDAT) Background
Document for Barium Wastes D005 and P013. Volume 19

(U.S.) Environmental Protection Agency, Washington, DC

Nov 89



U.S. Department of Commerce
National Technical Information Service

NTIS

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/530-SW-90-0118	2.	3. RB90-166307
4. Title and Subtitle PROPOSED BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT FOR BARIUM WASTES D005 AND P013 (3RD 3RDS)	5. Report Date NOVEMBER 1989		6.
7. Author(s) ROSENGRANT/OSW	8. Performing Organization Rept. No.		
9. Performing Organization Name and Address U.S. EPA Office of Solid Waste 401 M. Street SW Washington, DC 20460	10. Project/Task/Work Unit No.		11. Contract (C) or Grant (G) No. (C) (G)
12. Sponsoring Organization Name and Address	13. Type of Report & Period Covered BACK. DODU. - 11/89		14.
15. Supplementary Notes			
16. Abstract (Limit: 200 words) This document presents the Agency's technical support and rationale for development/proposed regulatory standards for barium-containing wastes. Sections 2 through 6 present waste-specific information for the D005 wastes. Section 2 describes the industries affected by the regulation of these wastes, explains the processes generating these wastes, and presents available waste characterization data. Section 3 specifies the applicable and demonstrated treatment technologies for these wastes. Section 4 presents available performance data for the demonstrated technologies; Section 5 contains analyses of the performance data to determine BDAT; and Section 6 contains the determination of the proposed treatment standards for the regulated constituent (barium). Section 7 discusses associated P-code barium-containing			
17. Document Analysis a. Descriptors b. Identifiers/Open-Ended Terms c. COSATI Field/Group			
18. Availability Statement RELEASE UNLIMITED	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 0	
	20. Security Class (This Page) UNCLASSIFIED	22. Price 0	

(See ANSI-Z39.18)

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)

**PROPOSED
BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)
BACKGROUND DOCUMENT FOR BARIUM WASTES D005 AND P013**

U.S. Environmental Protection Agency
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November 1989

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1. INTRODUCTION

Pursuant to section 3004(m) of the Resource Conservation and Recovery Act (RCRA) as enacted by the Hazardous and Solid Waste Amendments (HSWA) on November 8, 1984, the Environmental Protection Agency (EPA) is proposing treatment standards based on the best demonstrated available technology (BDAT) for barium in characteristic wastes identified in 40 CFR 261.24 as waste code D005 and for commercial chemical product wastes identified in 40 CFR 261.33 as waste code P013 - barium cyanide. Treatment standards for cyanides contained in P013 - barium cyanide were promulgated with the Final Rule for Second Third Wastes (54 FR 26614, June 23, 1989). Compliance with treatment standards is a prerequisite for placement of wastes in facilities designated as land disposal units according to 40 CFR Part 268. The effective date of final promulgated treatment standards for barium in D005 and P013 wastes will be May 8, 1990.

This background document presents the Agency's technical support and rationale for developing proposed regulatory standards for barium-containing wastes. Sections 2 through 6 present waste-specific information for the D005 wastes. Section 2 describes the industries affected by the regulation of these wastes, explains the processes generating these wastes, and presents available waste characterization data. Section 3 specifies the applicable and demonstrated treatment technologies for these wastes. Section 4 presents available performance data for the demonstrated technologies, including data on which treatment standards are based. Section 5 contains analyses of the performance data to determine BDAT, and Section 6 contains the determination of the proposed treatment standards for the regulated constituent (barium). Section 7 discusses associated P-code barium-containing wastes (P013 - barium cyanide) and details the development of the proposed treatment standard for these wastes.

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The BDAT program and promulgated methodology are more thoroughly described in two additional documents: Methodology for Developing BDAT Treatment Standards (USEPA 1989a) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT") (USEPA 1988a). The petition process to be followed in requesting a variance from the BDAT treatment standards is discussed in the methodology document.

Treatment standards are being proposed for the wastewater and nonwastewater forms of D005 and P013 wastes. For the purposes of determining BDAT and developing treatment standards, a wastewater is defined by the Agency as a waste containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Wastes not meeting this definition must comply with the treatment standards for nonwastewaters.

For wastewater forms of D005 and P013, lime precipitation followed by sedimentation and filtration is determined to be BDAT based on performance data presented in Section 4. The Agency is proposing a treatment standard of 1.15 mg/l for barium in D005 and P013 wastewaters based on the performance of this technology. Compliance with this proposed wastewater standard is determined based on analysis of a 24-hour composite sample. For the nonwastewater forms of D005 and P013, acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization is determined to be BDAT based on performance data presented in Section 4. The Agency is proposing that this treatment train be required as a method of treatment for barium in D005 and P013 nonwastewaters. The proposed treatment standards for barium-bearing wastes are listed in Tables 1-1 and 1-2.

* The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, the quantity of total suspended solids is measured by Method 209C (Total Suspended Solids Dried at 103°C to 105°C) in Standard Methods for the Examination of Water and Wastewater, 16th Edition (APHA, AWWA, and WPCF 1985).

Table 1-1 Proposed BDAT Treatment Standard for D005
and P013 Wastewaters

Constituent	Maximum for any 24 hour composite sample
	Total composition (mg/l)
Barium	1.15

Table 1-2 Proposed BDAT Treatment Standard for D005
and P013 Nonwastewaters

Regulated constituent	Proposed treatment standard
Barium	Acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization as a method of treatment.

2. INDUSTRIES AFFECTED AND WASTE CHARACTERIZATION

As defined in 40 CFR 261.24, D005 wastes are wastes that exhibit the characteristic of EP toxicity for barium. In other words, D005 wastes have a barium concentration of greater than 100 mg/l, as measured by the EP Toxicity Leaching Procedure (SW-846 Method 1310, USEPA 1986a).

Section 2.1 describes the industries affected by the land disposal restrictions for D005 wastes and describes the processes identified by EPA that may generate these wastes. Section 2.2 summarizes the available waste characterization data for D005 wastes. Section 2.3 uses the Agency's analyses of the sources of D005 wastes and waste composition to divide D005 wastes into treatability groups.

2.1 Industries Affected and Process Descriptions

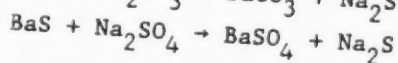
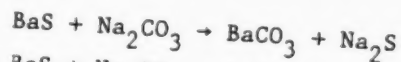
The industries affected by the land disposal restrictions for D005 wastes are (1) the inorganic chemicals industry, which produces various inorganic barium compounds, and (2) industries that use barium compounds to manufacture various products. The barium compounds manufactured and used by these industries are discussed below.

2.1.1 Production of Inorganic Barium Compounds

Barium does not occur in its free state in nature. Its compounds are widely distributed in the earth's crust in igneous rocks, sandstone, and shale. The major barium minerals are barium sulfate (baryte) and barium carbonate (witherite). Barium sulfate is mined in the United States to produce either barium metal or its compounds.

The initially mined barium sulfate is usually reduced to barium sulfide (also known as black ash) by calcining with coke in a rotary kiln at temperatures of 1000 to 1250°C in the oxygen-free environment of the kiln. The resultant ash is quenched in water to dissolve the barium sulfide to provide a 12 to 30 percent solution. The resultant solution

may be used to produce other barium salts such as barium carbonate, barium chloride, barium nitrate, and barium sulfate. The following are examples of reactions used to make barium carbonate and barium sulfate, respectively:



The major producers of barium compounds are Barium & Chemicals, Inc., of Steubenville, Ohio, and Chemical Products Corporation, of Cartersville, Georgia (SRI 1989).

2.1.2 Users of Inorganic Barium Compounds

Barium carbonate is the most important and most widely used barium compound. It is utilized in the manufacture of bricks, in ceramics manufacture, in oil drilling fluids as "muds" and lubricating compound precursors, in the precipitation of "synthetic" barium sulfate for photographic and medicinal end uses, and in the manufacture of glass. Barium chloride is used in production of pigments and colors. Barium nitrate is widely used in the pyrotechnics industry for the production of tracer bullets, flares, and detonators. Other barium compounds are used as lubricating oils and greases and as metallic soaps. Some of the black ash is processed to provide barium metal, which is highly reactive and is used as a "getter" in electronics equipment and vacuum tubes.

2.2 Waste Characterization

The Agency has information from 57 facilities generating D005 wastes. These facilities reported generating 67 D005 waste streams. This information was obtained from EPA's 1986 National Survey of Hazardous Waste Generators (the Generator Survey, USEPA 1986b).

Forty-eight of the waste streams generated were nonwastewater forms of D005; 10 of the waste streams generated were wastewaters. For the remainder of the waste streams, generators reported that the form of the waste generated was indeterminable. Barium concentrations reported by facilities were as follows:

<u>Ba Concentration in Waste:</u>	<u>No. of Facilities:</u>
50 - 75%	1
25 - 50%	5
10 - 25%	3
1 - 10%	2
0.1 - 1%	8
500 ppm - 0.1%	2
100 - 500 ppm	13
10 - 100 ppm	5
Unknown	18

Most D005 wastes are generated in inorganic matrices. However, generator survey data indicate that D005 wastes may sometimes have significant quantities of organic constituents such as F001-F005 spent solvents or waste oils. The levels of organics reported in D005 waste streams by two facilities were 98 percent and 25 percent, respectively.

2.3 Determination of Waste Treatability Groups

EPA believes that in some cases, wastes with the same waste code but produced in different processes in an industry or in different industries, may not be treatable to similar concentrations using the same technologies. In these instances, the Agency may subdivide a waste code into several treatability groups. This is done when the chemical forms of the wastes are different and the wastes require different treatments or combinations of treatments. For example, inorganic and organometallic compounds containing the same metals frequently require different types of treatment.

Based on a careful review of information on the generation of D005 wastes and available waste characterization data from a variety of barium-containing wastes, the Agency has determined that all D005 wastewaters form a single treatability group. The Agency has also determined the same to be true for D005 nonwastewaters.

The concentration of barium in D005 wastes is dependent on the waste type, the particular production process employed, and the specifics of the treatment process used. However, all D005 wastewaters are expected to be treatable to similar levels by use of the same technologies. The Agency believes that all wastewater forms of barium wastes have similar compositions in terms of waste characteristics that affect treatment performance for BDAT list metals such as the concentration of the metals and the presence of organics. D005 wastewaters are not expected to have high concentrations of organics.

Presently, the Agency believes that all D005 nonwastewaters also can be treated to similar levels by use of the same technologies based on the same reasons as discussed above for wastewaters. However, the Agency believes that there is a possibility that D005 nonwastewaters containing high levels of organics may be generated. Therefore, the Agency is soliciting information on whether these wastes actually exist, the concentration of barium and organics within these wastes, and treatment data for these wastes. If the Agency finds that these wastes do exist and treatment data is submitted, the Agency may define these wastes as a separate treatability group based on the level of organics and barium and promulgate resultant concentration-based standards based on these data. However, if information is submitted that these wastes exist but no treatment data are submitted from which concentration-based standards can be developed, the Agency may promulgate "Incineration Followed by Stabilization as a Method of Treatment" for these wastes.

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

Section 2 established a single treatability group for D005 wastewaters, and another treatability group for D005 nonwastewaters. This section identifies the treatment technologies that are applicable to these groups and determines which, if any, of the applicable technologies can be considered demonstrated for the purpose of establishing BDAT.

To be applicable, a technology must be theoretically usable to treat the waste in question or to treat a waste that is similar in terms of the parameters that affect treatment selection. For detailed descriptions of the technologies applicable for these wastes, or for wastes judged to be similar, see EPA's Treatment Technology Background Document (USEPA 1989b). To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or a similar waste. Technologies available only at pilot- and bench-scale operations are not considered in identifying demonstrated technologies.

3.1 Applicable Treatment Technologies

The technologies applicable for treatment of barium-containing wastes are those that reduce the concentration of barium in the treated residual and/or reduce the leachability of barium in the treated residual.

3.1.1 Applicable Technologies for Wastewaters

Barium-containing wastewaters are typically generated from the inorganic chemicals industry. The two technologies that the Agency has identified as applicable for barium-containing wastewaters are chemical precipitation and ion exchange. These technologies are described below.

(1) Chemical precipitation. Chemical precipitation typically involves addition of lime (calcium hydroxide), or caustic (sodium hydroxide), to the wastewater solution with pH adjustment. This would result in the precipitation of barium as barium hydroxide. Barium, however, is usually precipitated as barium sulfate using sodium sulfate, ferric sulfate or aluminum sulfate, or precipitated as barium carbonate at a pH of 10-10.5 with lime used for pH adjustment. These precipitation techniques are usually used for barium-containing wastes because barium sulfate and barium carbonate are the most insoluble barium compounds. Metal salts precipitated from solution are usually gravity settled and/or filtered. The collected solids may then be further treated by a technology applicable to nonwastewaters prior to disposal. The treated wastewater may be further treated for other components or discharged. Chemical precipitation is discussed in the Treatment Technology Background Document (USEPA 1989b).

(2) Ion exchange. This technology is applicable to treatment of wastewaters containing relatively low concentrations of dissolved metals. The metal must be in a soluble ionic form in order to be removed by this technology. The waste is passed through a bed of ion exchange resin beads. The resin adsorbs the soluble ions, thus removing them from solution. Ion exchange produces both a wastewater residual (from regeneration of the ion exchange resin) and a nonwastewater residual (the spent ion exchange resin). The spent regenerate solutions (usually acid solutions) are more concentrated than the original untreated waste (though much lower in volume), and must be treated for metals removal by chemical precipitation followed by filtration if the regenerate solution is not recyclable. Ion exchange is discussed in detail in the Treatment Technology Background Document (USEPA 1989b).

3.1.2 Applicable Technologies for Nonwastewaters

Barium-containing nonwastewaters are generated as inorganic solids and sludges typically from treatment of wastewaters, or as ash or slag from thermal processes, such as incineration or metallurgical processes. The two technologies that the Agency has identified as applicable for barium-containing nonwastewaters are stabilization and chemical precipitation. These technologies are described below.

(1) Stabilization technologies. Stabilization treatment technologies are designed to reduce the leachability of metals in the treated waste compared to that in the untreated waste. These technologies involve mixing the waste with lime, fly ash mixtures, cement, concrete mixtures or other formulations both proprietary and nonproprietary. Water is then added, and the mixture sets into a solid mass that can be land disposed. Stabilization technologies are discussed in detail in the Treatment Technology Background Document (USEPA 1989b).

(2) Chemical precipitation. Chemical precipitation technologies are normally used to treat wastewaters. They may also be used, however, to treat suspensions of solids in water. Such suspensions may meet the definition of nonwastewaters (i.e., greater than 1 percent suspended solids). These technologies were previously discussed in Section 3.1.1 on wastewaters.

3.2 Demonstrated Treatment Technologies

3.2.1 Demonstrated Technologies for Wastewaters

Chemical precipitation. This technology has been demonstrated on a commercial basis to treat a wide variety of wastewaters containing metal constituents such as the listed waste K062. K062 contains relatively

high concentrations of metals such as cadmium and lead. The use of chemical precipitation to treat K062 wastewaters is described in the K062 background document (1988f).

3.2.2 Demonstrated Technologies for Nonwastewaters

(1) Stabilization. This technology has been demonstrated on a commercial basis to treat metal-bearing wastes such as the listed wastes K061 and F006. These wastes contain relatively high concentrations of metals such as cadmium and lead. The use of stabilization to treat these wastes is described in the K061 background document (USEPA 1988b) and the F006 background document (USEPA 1988c).

(2) Chemical precipitation. As previously discussed, chemical precipitation technologies are normally used to treat wastewaters. However, they may also be used to treat suspensions of solids in water. These technologies are discussed further in Section 3.2.1 on wastewaters.

4. PERFORMANCE DATA BASE

This section presents relevant data available to EPA on the performance of demonstrated technologies in treating listed wastes containing barium in concentrations similar to concentrations expected to be found in D005 wastes. These data are used elsewhere in this document for determining which technologies represent BDAT (Section 5) and for developing treatment standards (Section 6). Eligible data, in addition to full-scale demonstration data, may include data developed at research facilities or obtained through other applications at less than full-scale operation, as long as the technology is demonstrated in full-scale operation for a similar waste or wastes as defined in Section 3.

Performance data, to the extent that they are available to EPA, include the untreated and treated waste concentrations for a given constituent, the values of operating parameters that were measured at the time the waste was being treated, the values of relevant design parameters for the treatment technology, and data on waste characteristics that affect performance of the treatment technology.

Where data are not available on the treatment of the specific wastes of concern, the Agency may elect to transfer data on the treatment of a similar waste or wastes, using a demonstrated technology. To transfer data from another waste category, EPA must find that the wastes covered by this background document are no more difficult to treat (based on the waste characteristics that affect performance of the demonstrated treatment technology) than the treated wastes from which performance data are being transferred.

4.1 Performance Data for Wastewaters

This section summarizes the performance data available to the Agency on the treatment of D005 wastewaters. Data on the treatment of barium was not available in the Effluent Limitations Guidelines for the Inorganic Chemicals Manufacturing Industry (USEPA 1982). However, the reference manual, Industrial Wastewater Treatment Technology (Patterson 1985), contains performance data on the treatment of barium wastes. The technologies used for barium treatment included chemical precipitation of barium as barium sulfate, barium carbonate, and barium hydroxide and treatment by ion exchange. The concentration of barium in the wastes treated ranged from 2,100 mg/l to 0.5 mg/l. Percent removal ranged from 11 to >99 percent. The waste containing 2,100 mg/l of barium was the only waste containing barium above the EP toxicity level of 100 mg/l. Treatment by sulfate precipitation reduced the barium concentration in this waste to 1.78 mg/l. Only one barium waste did not undergo significant treatment (11 percent removal). This waste contained a relatively small concentration of barium. Other information available from the literature (Kirkpatrick 1978, Versar 1980) also indicated that barium may be chemically precipitated as barium sulfate or barium carbonate. Chemical precipitation as sulfate or carbonate is a favorable treatment for barium because of the relative insolubility of these compounds. Barium sulfate is relatively insoluble in water and weak acids. Barium carbonate is relatively insoluble in water. The solubilities of some barium compounds are presented below:

<u>Compound Name</u>	<u>Solubility in Water</u> (Grams/Liter)	<u>Temperature</u> (°C)
Barium Acetate	588	0
Barium Formate	262	0
Barium Carbonate	0.02	20

<u>Compound Name</u>	<u>Solubility in Water</u> (Grams/Liter)	<u>Temperature</u> (°C)
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(continued)

Barium Chloride	317	0
Barium Bromide	922	0
Barium Iodide	170	0
Barium Hydroxide	17	0
Barium Nitrate	50	0
Barium Sulfate	0.00285	30
Barium Hydrosulfide	326	0
Barium Sulfite	0.197	20

Source: Kirkpatrick 1978, Weast 1977.

Additional wastewater treatment data, primarily from EPA's Office of Water, have been analyzed for the development of concentration-based treatment standards for D005 and other wastewaters. Further information on these data, including the sources of the data and the treatment technologies used, can be found in the Preamble to the Third Third Land Disposed Restrictions Proposed Rule and in the Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents (USEPA 1989d).

4.2 Performance Data for Nonwastewaters

The Agency believes that the data discussed in Section 4.1 for treatment of wastewaters by chemical precipitation as sulfate or carbonate are also applicable for D005 nonwastewaters. As previously described in Section 3, chemical precipitation can be used to treat suspensions of solids in water.

No stabilization data are available specifically for treatment of D005 nonwastewaters. However, some of the wastes that have been stabilized by EPA have shown that for wastes with low leachable concentrations of barium (such as 0.7 to 1.8 mg/l), barium can be treated further by stabilization (see USEPA 1987a, USEPA 1987b).

5. IDENTIFICATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining best demonstrated available technology (BDAT) for D005 wastewaters and nonwastewaters.

To determine BDAT, the Agency examines all available performance data on technologies that are identified as demonstrated to determine (using statistical techniques) whether one or more of the technologies perform significantly better than the others. The technology that performs best on a particular waste or waste treatability group is then evaluated to determine whether it is "available." To be available the technology must (1) be commercially available to any generator and (2) provide "substantial" treatment of the waste, as determined through evaluation of accuracy-adjusted data. In determining whether treatment is substantial, EPA may consider data on the performance of a waste similar to the waste in question provided that the similar waste is at least as difficult to treat. If the best technology is found to be not available, then the next best technology is evaluated, and so on.

5.1 Wastewaters

For D005 wastewaters, the Agency has identified lime precipitation followed by sedimentation and filtration as the "best" treatment. This is based on the performance data on chemical precipitation from EPA's Office of Water as previously discussed in Section 4.

5.2 Nonwastewaters

For D005 nonwastewaters, the Agency has identified acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization as the "best" treatment. This is based on the performance

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data on chemical precipitation as sulfate or carbonate and the low solubility factors for barium sulfate and barium carbonate, as previously discussed in Section 4.

EPA has determined that the best demonstrated technologies specified above for the D005 treatability groups (i.e., lime precipitation followed by sedimentation and filtration for wastewaters and acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization for nonwastewaters) are also commercially available and provide substantial treatment. Hence, these technologies represent BDAT for D005 wastewaters and nonwastewaters, respectively.

6. DEVELOPMENT OF BDAT TREATMENT STANDARDS

In Section 5, the Agency chose the best demonstrated available technology (BDAT) for both D005 wastewaters and nonwastewaters based on the treatment data available to the Agency. In this section, the treatment standards based on the BDAT will be developed.

6.1 Wastewaters

For D005 wastewaters, the Agency is proposing a treatment standard for barium based on the performance of lime precipitation followed by sedimentation and filtration. The calculation of this treatment standard is presented in the Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents (USEPA 1989d). The proposed treatment standard for D005 wastewaters is summarized in Table 6-1.

6.2 Nonwastewaters

For D005 nonwastewaters, the Agency is proposing that acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization be required as a method of treatment. The proposed treatment standard for D005 nonwastewaters is summarized in Table 6-2.

Table 6-1 Proposed BDAT Treatment Standard for D005 Wastewaters

Constituent	Maximum for any 24 hour composite sample
	Total composition (mg/l)
Barium	1.15

Table 6-2 Proposed BDAT Treatment Standard for D005 Nonwastewaters

Regulated constituent	Proposed treatment standard
Barium	Acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization as a method of treatment.

7. P WASTE CODES

This section addresses regulation of the only P waste that is listed for barium. This waste, P013 - barium cyanide is identified in 40 CFR 261.33 as "discarded commercial chemical products, off-specification species, container residues, and spill residues thereof". Treatment standards for cyanides in P013 wastes were promulgated with the Final Rule for Second Third Wastes (54 FR 26614, June 23, 1989). Therefore, this section will only address the development of a treatment standard for barium in P013 wastes. Detailed information on the development of cyanide treatment standards for P013 wastes is included in the BDAT background document for cyanide wastes (USEPA 1989c).

7.1 Industries Affected

Barium cyanide is prepared by the reaction of barium hydroxide with hydrocyanic acid in water followed by low temperature evaporation under vacuum (Jenks 1978). Barium cyanide is used in the metallurgy and electroplating industries (Hawley 1981). Additional information on the industries affected by the land disposal restrictions for barium wastes is presented in Section 2.1.

7.2 Applicable and Demonstrated Treatment Technologies

The treatment technologies described in Section 3 as being applicable and demonstrated for D005 barium wastes are also considered to be applicable and demonstrated for P013. EPA has no other data suggesting that other treatment technologies are applicable or demonstrated for P013 wastes.

7.3 Determination of Best Demonstrated Available Technology

EPA believes that P013 wastes, as commonly generated, are similar to D005 wastes. Therefore, the Agency expects P013 wastes to be generated

as wastewaters or to be easily dissolvable in water prior to treatment. The solubility in water of barium cyanide is 800 g/l (Weast 1977). Because barium cyanide is very water soluble, the Agency believes that the best way to treat nonwastewater forms of P013 is to dissolve them in water (if they are not already dissolved) and then treat them by a technology applicable to wastewaters.

Based on performance data on the treatment of barium-containing wastes and information showing the relative insolubility of barium sulfate and barium carbonate as presented in Section 4, the Agency has identified lime precipitation followed by sedimentation and filtration as the "best" treatment for P013 wastewaters. For P013 nonwastewaters, the Agency has identified acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization as the "best" treatment.

EPA has also determined that the best demonstrated technologies specified above for P013 wastewaters and nonwastewaters are commercially available and provide substantial treatment. Hence, these technologies represent BDAT for P013 wastewaters and nonwastewaters.

7.4 Selection of Regulated Constituents

EPA is proposing a treatment standard for barium in P013 wastes. Treatment standards for cyanides in P013 wastes were promulgated in the Final Rule for Second Third Wastes (54 FR 26614 June 23, 1989). Barium and cyanides are the only Appendix VIII constituents for which P013 wastes are listed, and they are the only BDAT list constituent that the Agency expects to find in the wastes on a regular basis (unless these wastes are mixed with other listed hazardous wastes, in which case other treatment standards would also apply).

7.5 Calculation of Proposed Treatment Standards

For P013 wastewaters, the Agency is proposing a treatment standard for barium based on the performance of lime precipitation followed by sedimentation and filtration. The calculation of this treatment standard is presented in the Best Demonstrated Available Technology (BDAT) Background Document for Wastewaters Containing BDAT List Constituents (USEPA 1989d). The proposed treatment standard for P013 wastewaters is summarized in Table 7-1.

For P013 nonwastewaters, the Agency is proposing that acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization be required as a method of treatment. The proposed treatment standard for P013 nonwastewaters is summarized in Table 7-2.

Table 7-1 Proposed BDAT Treatment Standard for P013 Wastewaters

Constituent	Maximum for any 24-hour composite sample
	Total composition (mg/l)
Barium	1.15

Table 7-2 Proposed BDAT Treatment Standard for P013 Nonwastewaters

Regulated constituent	Proposed treatment standard
Barium	Acid or water leaching followed by chemical precipitation as sulfate or carbonate and stabilization as a method of treatment.

8. REFERENCES

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